YEAR 1889

Nine storms were found to have occurred in 1889. Tracks for these storms are presented in Fig. 2.

Storm 1, 1889 (May 16-21), H.

The following information was found in relation to this storm: 1) This depression is given an approximate path N. of the West Indies from May 16 to May 19, during which period it possessed moderate intensity. The storm center was central near 30 degrees N., 75 degrees W. on May 19, whence it recurved northward and on the morning of May 21 was located in about 36 degrees N., 72 degrees W. During this day the depression apparently moved northward and united with a low pressure area which occupied the Saint Lawrence Valley. Reports indicate that the disturbances attaining the depression were not severe in character, except on May 21, when gales of hurricane force were reported. The lowest barometric pressure, about 29.60 inches, was also noted on May 21 (Monthly Weather Review, May 1889). 2) Vineyard Haven, May 27. Schr. "Joseph W. Fish" encountered a heavy N.N.W. gale at lat. 38 20 N., long. 74 50 W. (no date), during which the cargo shifted and the vessel was split open on her waterways and filled of water. The captain and crew were rescued by the schooner "Josiah R. Becker" and landed here (The New York Times, May 28, 1889, p.1, col.4). Author's note: Although indications are that this item pertains to this storm, no date was given and, therefore, it is not possible to assure that this is the case. 3) Map showing a track for the storm. Daily positions are as follows: May 16, 21.5 degrees N., 64.7 degrees W.; May. 17, 23 degrees N., 66.8 degrees W.; May 19, 29 degrees N., 74.7 degrees W.; May 20, 32 degrees N., 74.7 degrees W.; May 21, 36 degrees N., 71.2 degrees W.; the track was ended at 40.7 degrees N, 70 degrees W. (Monthly Weather Review, May 1889).

Information contained in the above items was found to support, in general, the storm track displayed in Neumann et al. (1993). Therefore, such a track is reproduced in Fig. 2.

Hurricane force gales, which were reported on May 21 (item 1), were found to justify the hurricane status given to the storm in Neumann et al (1993) in spite of that the lowest pressure of about 29.60 inches only suggested tropical storm intensity.

Storm 2, 1889 (Jun. 15-20), T. S.

The following information was found about this storm: 1) Marine reports show that a storm was central to the W. of Cuba on Jun. 15 and 16. By the morning of Jun. 17 it had reached the west Florida coast, passing to the N.E. over northern Florida during that day and causing winds of 34 and 43 mph at Jupiter and Cedar Keys, respectively. It continued its N.E. course on Jun. 18 attended by severe gales, the wind at Charleston reaching 34 mph from the E. On Jun. 19 it was apparently central off the middle Atlantic coast, causing a wind from the E. to N.E. at 36 mph at Block Island. It probably united with a low pressure area which was then located over the lower Saint Lawrence Valley (Monthly Weather

Review, Jun. 1889). 2) Cyclone of Jun. 15-16, 1889. It was a weak one which formed over the South Sea (the Caribbean) and passed over Pinar del Rio, its effects having been felt over the two westernmost provinces of Cuba. There was extensive flooding, some houses and buildings collapsed and some vessels and lives were lost (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza which is included in Sarasola (1928). 3) Small cyclone affected Pinar del Rio on Jun. 15 and 16, 1889 (Martinez-Fortun, 1942). 4) Maximum wind velocities: Cedar Keys, E. 43 mph on Jun. 17; Jupiter, S. 35 mph on Jun.17; Charleston, E. 35 mph on Jun. 18 (Monthly Weather Review, Jun. 1889). 5) Schr. "Robert Myhan", from New York for Honduras, was abandoned at 3 P.M. Jun. 18 at lat. 39 N., long. 67 40 W. waterlogged. The crew arrived today on board the schooner "Basse H. Rose", from Buenos Aires (The New York Times, Jun. 26, 1889, p.1, col.1) Author's note: It is possible that this item might not be linked to the storm. 6) Halifax, Jun. 20. A heavy rain storm last night and today caused the greatest freshet ever seen in the Folly and Great Village (The New York Times, Jun. 21, 1889, p.4, col.7). 7) Map showing a track for the storm. Daily positions are: Jun. 15, 19.7 degrees N., 85 degrees W.; Jun. 16, 23 degrees N., 85.7 degrees W.; Jun. 17, 28 degrees N., 84 degrees W.; Jun. 18, 32 degrees N., 78 degrees W.; Jun. 19, 37 degrees N., 73.7 degrees W. (Monthly Weather Review, Jun. 1889). 8) The storm was first observed near lat. 20 N., long. 85 W. and recurved at lat. 24 N., long. 86 W. (Mitchell, 1924). Author's note: It was claimed in this publication that the storm was last observed at lat. 68 N., long. 16 W., obviously after uniting with an extratropical system.

The track for this storm which is displayed in Neumann et al. (1993) was found to be reasonable in the light of the information contained in most of the above items. Therefore, such a track is reproduced in Fig. 2.

The tropical storm status which Neumann et al. (1993) assigned to the storm was also found to be supported by the information contained in the above items.

Storm 3, 1889 (Aug. 19-25), H.

The following information was found about this storm: 1) On Aug. 19 a depression was indicated S. of Santo Domingo in which region it apparently remained until Aug. 23. On this latter day a cyclonic disturbance was apparently central S. of Cuba and W. of Jamaica (Monthly Weather Review, Aug. 1889). 2) Observations from Dominican Republic: Santo Domingo, 5 P.M Aug. 19, barometer 29.57 inches, wind S.E., strong, cloudy, calm sea; 4 P.M. Aug 20, barometer 29.53 inches, wind S., storm; 3 P.M. Aug. 21, barometer 29.45 inches, wind S., storm; Puerto Plata, the same; Aug. 22, telegrams from Santo Domingo and Puerto Plata indicate that the storm has crossed over the central portion of the island of Santo Domingo in a N.W. direction; Santo Domingo, 5 P.M. Aug. 22, barometer 29.41 inches; 5 P.M. Aug. 23, barometer 29.45 inches, wind S.E., light storm, sea agitated. As of the storm of Santo Domingo there have been no indication whatever at Havana (Monthly Weather Review, Aug. 1889). Author's note: The above were

telegraphic reports from the Rev. Benito Vines, S.J., director of the Meteorological Observatory of the Belen College, Havana. Barometer readings taken at Santo Domingo are strongly suspected to be too low and the barometer behavior might be unreliable. The New York Times, Aug. 24, 1889, p.5, col.3, also published a dispatch from Havana, dated on Aug. 23, indicating that a telegram from Santo Domingo reported S.E. winds and a heavy sea. 3) Observations from Santiago de Cuba: Morning of Aug. 23, barometer 29.98 inches; at 3 P.M. Aug. 23, barometer 29.88 inches, cloudy, thunder-claps cloudy to the S.; 7 A.M. Aug. 24, barometer 29.98 inches, calm, misty, cirrocumulus from S., stratocumulus from S.E.; 3 P.M. Aug. 24, barometer 29.93 inches, wind S., good weather, stratocumulus from S., cirrus from W. (Monthly Weather Review, Aug. 1889). Author's note: This information was also furnished to the Signal Service by Father Vines of Havana. 4) Selected storm messages signed by Dunwoody, Acting Chief Signal Officer: 10:55 P.M. Aug. 23. Reports indicate that a severe storm is approaching Florida from the S.E., although dangerous winds have not occurred at any of the coastal stations and conditions of storm are not sufficiently defined to justify the ordering of signals. Aug. 25. Cyclone apparently central S.E. of Hatteras, moving northward. 12:10 P.M. Aug. 26. Brisk to high N.E. winds indicated for the Middle Atlantic coast. Cyclone apparently central distant from the coast moving N.E. along the Gulf Stream (Monthly Weather Review, Aug. 1889. 5) Reports admit of locating its center in about 33 degrees N., 74 degrees W. on Aug. 25. By Aug. 26 the storm center had moved N.E. to the 35 degrees N. parallel and by Aug. 27 had advanced to about the 37 degrees N. parallel. A noteworthy feature of this storm was the unusual strength of the gale attaining a relatively slight barometric depression. The barometer readings reported near the storm center did not fall below 29.90 inches from Aug. 25 through Aug. 28. Whole gales attaining hurricane force were reported W. of the 70 degrees W. meridian and at latitudes between 35 and 40 degrees N. on Aug. 27 and 28 (Monthly Weather Review, Aug. 1889). 6) Asbury's Partk, N.J., Aug. 26. A heavy N.E. gale prevailed along the shore today and the surf was extremely rough (The New York Times, Aug. 27, 1889, p.1, col.5). 7) Schr. "Red Wing" left Fernandina, Fl. 16 days ago and on Aug. 28, when off Cape Henry, was struck by a tail end of a violent hurricane which lasted 4 days. The wind came from N.E. and raised a terrific sea (The New York Times, Sept. 7, 1889, p.8, col.5). 8) Map showing a track for this storm. Daily positions are: Aug. 25, 33 degrees N., 74 degrees W.; Aug. 26, 35 degrees N., 72 degrees W.; Aug. 27, 37 degrees N., 72.3 degrees W. (Monthly Weather Review, Aug. 1889).

Because of the rather unreliable barometer readings at Santo Domingo (item 2), the author of this study found it difficult to properly verify the track in Neumann et al. (1993) prior to Aug. 23. However, the above mentioned track seems to be reasonable for the period Aug. 23-27 in the light of information contained in items 4) through 8). The combination of both findings above resulted in accepting the entire track in Neumann et al. (1993) without introducing any modification and in reproducing it in Fig. 2.

The whole gales attaining hurricane force which were reported

W. of the 70 degrees W. meridian and at latitudes between 35 and 40 degrees N. on Aug. 27 and 28 (item 5) were found to justify the hurricane status that Neumann et al. (1993) attributed to this storm. It should be noted, however, that the relatively high pressure reported in the same item (about 29.90 inches) did not seem to justify a hurricane status.

Storm 4, 1889 (Sept. 1-12), H.

The following information was found in relation with this storm: 1) Storm of Sept. 1-13, 1889. St Kitts, St. Thomas, Hatteras. Severe in West Indies and considerable damage along the Atlantic coast (Tannehill, 1938). 2) Vessel reports indicate that this disturbance existed to the eastward of the Windward Islands on Sept. 1, probably central in lat. 14 N., long. 57 W. (Monthly Weather Review, Sept. 1889). 3) Observations from St. Kitts. Night of Sept. 2, barometer 29.50 inches, wind N.E. From 10:15 P.M. to 12:45 A.M. Sept. 3, wind light and calm with falling barometer; 2 A.M. Sept. 3, barometer 29.38 inches, wind changing to S.W.; 2:30 A.M., barometer 29.70 inches, wind and sea dreadful. The steamship "Roraima" and the schooner "Circe" were lost; the crews were saved (Monthly Weather Review, Sept. 1889). Author's note: The above information and all other information related to the storm in the West Indies was furnished to the Signal Service by Rev. Benito Vines, S.J., director of the Belen College Observatory, Havana. 4) Observations from the Virgin Islands. A cyclone of great intensity appeared in the morning of Sept. 3 near Santa Cruz (St. Croix) and St. Thomas. At St. Thomas the storm caused great damage in the country, the barometer fell to 28.97 inches and, from telegrams received at Havana, it is understood that the cyclone passed a short distance N. of that place. At Santa Cruz (St. Croix) the cyclone was very severe from 9 A.M. to noon Sept. 3, the barometer reading at 3 P.M. was 29.65 inches and the wind was still strong from S.W. at 5 P.M.; much damage was caused (Monthly Weather Review, Sept. 1889). 5) Observations from Puerto Rico. Sept. 2, 7 A.M., barometer 29.92 inches; 3 P.M., barometer 29.84 inches; Sept. 3, 7 A.M., barometer 29.76 inches, wind N.N.E. (Monthly Weather Review, Sept. 1889). Author's note: Although it was not specified, the above observations were probably taken at San Juan. 6) Observations from the Dominican Republic. Santo Domingo, Sept. 3, 4 P.M., barometer 29.72 inches, strong N. sea, thunder-claps; Sept. 4, 9 A.M., barometer 29.80 inches, clear, strong wind from N.; 5 P.M., barometer 29.75 inches, wind changed from E. to N.W,, a violent storm with torrents of rain since 1 P.M.; Sept. 5, 7 A.M., barometer 29.88 inches, cloudy, light wind from N., storm ceased at 11 P.M. Sept. 4. Puerto Plata, Sept. 4, 3:45 P.M., light wind from N.N.W., rainy, swelling sea (Monthly Weather Review, Sept. 1889). 7) Schr. "Gertrude". Sept. 6, in lat. 28 44 N., long. 64 52 W., barometer 29.52 inches, wind S. force 12; at 7 A.M., in lat. 27 32 N., long. 64 49 W., barometer 29. 49 inches, shifts of winds S.E., S.S.E., S. and S.W., highest force of wind 12 (Monthly Weather Review, Sept. 1889). Author's note: The time of the first observation given by the "Gertrude" was not indicated, but it was likely the noon observation. This issue of the Monthly Weather

Review also reported that the steamship "Excelsior", at lat. 28 41 N., long 78 18 W. on Sept. 6 had a barometer reading of 29.52 inches, with wind from the N.E. force 4, suggesting the formation of a new center to the west of the original disturbance. However, this observation did not seem to be directly linked with this storm. 8) The easternmost center of disturbance developed the greatest energy, and its tendency to recurve between Sept. 5 and 6 would indicate that it was the continuation of the storm traced over the Windward Islands. There was an apparent tendency for the disturbance to recurve after Sept. 5 and to follow a normal N.E. track, but the presence of an area of high pressure to the N. and E. interrupted this northeasterly movement and changed the course to the N.W. as indicated by the midday reports of Sept. 7. Its northwesterly course continued until Sept. 11, the storm evidently increasing in energy as it approached the coast. As the center reached lat. 38 N., long. 72 W., it was apparently forced to the southwestward by a still further re-enforcemtent of high pressure to the northward, which not only retarded its eastward movement but caused it to disappear by a gradual increase of pressure while central on the middle Atlantic coast (Monthly Weather Review, Sept. 1889). Author's note: A different explanation for the motion described in this item would have been an upper-air low located to the S.E. of Hatteras. 9) Bark "Sappho" took a gale in lat. 36 N., long. 70 W. on Sept. 8. For 36 hours the vessel was hove down on her beam ends (The New York Times, Sept. 18, 1889, p.5, col.2). 10) Barkentine "Edisworld" (Laguna, Mexico, Aug. 3 to Falmouth, England) put in here in distress. Weather was good until encountering a gale from E.S.E. off the Delaware coast, accompanied by a high confused sea. The wind blew with unabated fury from 4 A.M. Sept. 9 to the afternoon of Sept. 10 (The New York Times, Sept. 14, 1889, p.1, col.7). Author's note: The vessel should have been quite far off the Delaware coast to have experienced an E.S.E. gale. 11) Bark "Mici Nipoti"has returned. Sept. 9 and 10, lat. 38 N., long. 69 55 W. encountered a hurricane during which her bulwarks were stove and the decks washed for 40 hours (The New York Times, Sept. 17, 1889, p.3, col.6). 12) Pilot Petersen of the pilot boat "Washington No. 22" boarded the steamship "Hammonia" 100 miles E. of Sandy Hook on Sept. 11. He stated that his boat felt the storm on Sept. 10, blowing a perfect hurricane from E.N.E., with a very heavy southerly sea (The New York Times, Sept. 13, 1889, p.6, col.5). 13) The wind here (New York) was 41 mph at 7:45 P.M. (obviously on Sept. 10); by 9 P.M. had fallen to 34 mph. At Block Island, average wind all day (obviously Sept. 10) was 64 mph and at 8 P.M. blew at 48 mph (The New York Times, Sept. 11, 1889, p.1, col.5). Author's note: In addition, the Monthly Weather Review, Sept. 1889, indicated that the first positive information that the storm had reached the U.S. coast was a report of winds up to 48 mph during a sudden squall at the Block Island Signal Service station at 8 A.M. Sept. 9, although the observer stated that the storm did not begin there until 5 P.M. Sept. 9. 14) At Atlantic City, N.J. the high N.E. winds which prevailed from Sept. 8 to Sept. 12 attained a maximum velocity of 72 mph at 2:30 P.M. Sept. 10, causing the tide to rise very high on those days, the highest point being reached during the night of Sept. 10-11, when the meadows

along the water front and a portion of the city were inundated (Monthly Weather Review, , Sept. 1889). Author's note: In addition, The New York Times, Sept. 9, 1889, p.1, col.5 and The New York Times, Sept. 10, 1889, p.1, col.6, referred to high winds and seas at Atlantic City and at Asbury Park on the New Jersey coast. 15) At Philadelphia, high N.E. winds maintaining a steady velocity of 40-45 mph prevailed throughout the day of Sept. 10 and continued on Sept. 11, with an extreme velocity of 60 mph. on Sept. 10 (Monthly Weather Review, Sept. 1889). At Egg Harbor City, N.J., a severe N.E. storm prevailed during the night of Sept. 9-10 and throughout Sept. 10. Much damage has been done to crops and the fruit trees in this section (Monthly Weather Review, Sept. 1889). 16) Taken from The Baltimore Sun, Md., Sept. 12: The storm which prevailed with great persistence from Sept. 10 to 12 was severe on Chesapeake Bay. All steamers arriving at this port have been delayed 6 to 12 hours by the storm (Monthly Weather Review, Sept. 1889). 17) Lewis, Del: A most destructive storm raged in this section from Sept. 8 to Sept. 12. The telegraph station was washed away, the marine hospital dashed from the moorings and the live-saving station, located 40 feet above high water, was flooded and the foundation undermined. Humphreyville, a suburd between the town and the beach, was submerged, and its 200 inhabitants fled for their lives. Thirty-one vessels are known to have been wrecked or washed ashore. The total number of lives lost will probably exceed 40 (Monthly Weather Review, Sept. 1889). Author's note: The above information was taken from The Baltimore Sun, Md., Sept. 13. 18) Storm of Sept. 9-12, 1889. Middle Atlantic coast. Minimal. 40 killed, $ 2,356,000 damage (Dunn and Miller, 1960). Author's note: The minimal storm status seems to be an underestimate. 19) Map showing a track for the storm. Positions along the track are: Sept. 1, 14 degrees N., 56.5 degrees W.; Sept.2, 16 degrees N., 60.3 degrees W.; Sept. 3, 18.5 degrees N., 63.7 degrees W.; Sept. 4, 19.5 degrees N., 65.7 degrees W.; Sept. 5, 21.7 degrees N., 67 degrees W.; Sept. 6, 28.7 degrees N., 66 degrees W.; Sept. 7, 30.3 degrees N., 67.7 degrees W.; Sept. 8, 32 degrees N., 68 degrees W.; Sept. 9, 35 degrees N., 70.7 degrees W.; Sept. 10, 37 degrees N., 71.5 degrees W.; Sept. 11, 38 degrees N., 72.3 degrees W.; Sept. 12, 37 degrees N., 74 degrees W. (Monthly Weather Review, Sept. 1889). 20) Morning weather maps for the period Sept. 3-11, showing plotted data from vessels and land stations as well as surface pressure analyses (Monthly Weather Review, Sept. 1889). 21) The storm lasted for 12 days. It was first observed at lat. 12 N., long. 57 W. on Sept. 1 and last observed at lat. 36 N., long. 76 W. (Mitchell, 1924). Author's note: A track which is quite similar to the one in Neumann et al. (1993) is also displayed on a map contained in Mitchell (1924).

The information which is contained in the above items suggested some modifications along the track displayed in Neumann et. al. (1993). After having kept unchanged the 7 A.M. Sept. 1 position which is shown in that publication, the author of this study introduced a slight adjustment to the northwest in their 7 A.M. Sept. 2 position to near 15.7 degrees N., 60.3 degrees W., in order to fit a better space-time continuity with the storm passage over St. Kitts during the night of Sept. 2-3 (item 3) and the

author's estimated position near 18.0 degrees N., 64.0 degrees W. for 7 A.M. Sept. 3, which was primarily based on information in item 4) and was found to be about 50 miles to the S.W. of the corresponding position in Neumann et al. (1993). The author of this study estimated a position near 20.5 degrees N., 67.5 degrees W. for 7 A.M. Sept.4; this position was based on the southerly wind shown at San Juan on the morning weather chart for that day (item 20) as well as on some data from the Dominican Republic (item 6); the position is about 60 miles to the W. of the one displayed in Neumann et al. (1993). The author's 7 A.M. Sept. 5 estimated position was near 23.3 degrees N., 68.7 degrees W. and was based on the wind direction reported by several vessels along the periphery of the storm as displayed on the morning weather chart for that day (item 20); this position was about 60 miles to the S.S.W. of the one shown in Neumann et al. (1993). The author's 7 A.M. Sept 6 position was near 28.3 degrees N., 66.3 degrees W. and was estimated on the basis of the observations taken by the schooner "Gertrude" (item 7) and, to a much lesser extent, on some other ship data contained on the corresponding morning weather chart for Sept. 6 (item 20); this position is about 120 miles to the E.S.E. of the one in Neumann et al. (1993). On the basis of ship observations plotted on the morning weather chart for Sept. 7 (item 20), the author of this study adjusted the 7 A.M. Sept. 7 position in Neumann et al. (1993) by about 90 miles to the E.N.E. to near 32.0 degrees N., 67.0 degrees W. Similarly, the 7 A.M. Sept.8 and the 7 A.M. Sept. 9 positions in Neumann et al. (1993) were adjusted to the E.N.E. by about 50 miles to 34.0 degrees N., 68.3 degrees W. and by just a few miles to 35.5 degrees N., 69.5 degrees W., respectively, in order to fit a better space-time continuity between the 7 A.M. Sept. 7 position as estimated by the author of this study and the 7 A.M. Sept. 10 position in Neumann et al. (1993) which was kept unchanged. The last mentioned position as well as the ones shown by the above authors for 7 A.M. Sept. 11 and 7 A.M. Sept. 12 were kept unmodified because they were found to satisfy the wind data and the surface pressure analyses for the mornings of the respective days, which were displayed on the corresponding weather charts (item 20). The unchanged positions in Neumann et al. (1993) and the new position estimates produced by the author of this study were used in preparing the storm track which is shown in Fig. 2.

The lowest barometer reading of 28.97 inches reported from St. Thomas (item 4) and the force 12 wind reported by the "Gertrude" (item 7) were found to confirm the hurricane status that Neumann et al. (1993) attributed to the storm. The severity indicated in items 1) and 4) suggests that the storm might have been a major hurricane in the West Indies.

Storm 5, 1889 (Sept. 2-11), H.

The following information was found in relation to this storm: 1) The approximate path of this system is given N.E. of the Windward Islands on Sept. 4 and 5, after which a probable course northeastward to the 34 degrees N. parallel on Sept. 8 is indicated. From Sept.8 to Sept. 11, the storm center moved N. of E.

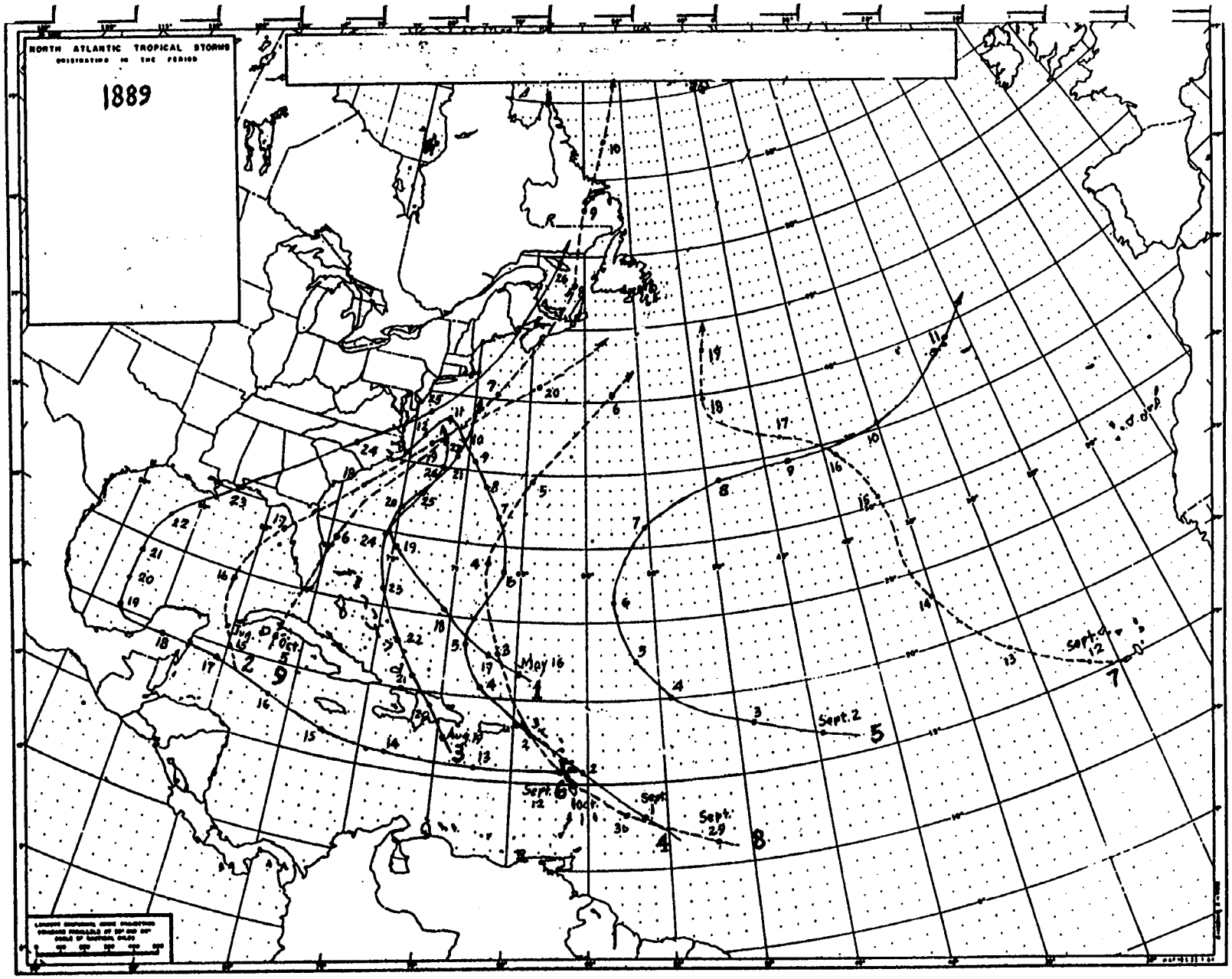
NORTH ATLANTIC TROPICAL STORMS
1889
May 16
Aug. 19
Sept. 2
Sept. 6
Sept. 29
Sept. 12
Oct. 5

Fig. 2.

to the Azores with low pressure and disturbances of great violence, after which date it apparently passed northward and united to a high latitude low pressure area (Monthly Weather Review, Sept. 1889). 2) New Orleans, Sept. 18. The steamship "Statesman" has arrived bringing the crew of the bark "Nobleza". Capt. Da Silvo sailed from Lisbon to Brunswick, Ga. on Aug. 1. On Sept. 5, at lat. 25 59 N., long. 58 05 W., encountered an E. gale, lasting through the day and the following day. The crew was rescued by the "Statesman" on Sept. 11 (The New York Times, Sept. 19, 1889, p.5, col.6). 3) Map showing a track for this storm. Positions along the track are: Sept. 4, near 20 degrees N., 55 degrees W.; Sept. 5, near 22 degrees N., 56 degrees W.; Sept. 6-7, positions not indicated; Sept. 8, 34 degrees N., 49 degrees W.; Sept. 9, 34.3 degrees N., 43 degrees W.; Sept. 10, 35 degrees N., 35 degrees W.; Sept. 11, 39 degrees N., 27 degrees W. (Monthly Weather Review, Sept. 1889). 4) Storm of Sept. 2-11, 1889. Far out in the Atlantic (Tannehill, 1938). 5) The storm lasted for 9 days. It was first observed at. lat. 16 N., long. 45 W. on Sept. 2; it recurved at lat. 27 N., long. 58 W. and it was last observed at lat. 40 N., long. 25 W. (Mitchell, 1924).

Based on information in items 2), 3) and 5) some modifications were introduced to the track displayed in Neumaann et al. (1993). The initial position for 7 A.M. Sept. 2 was kept unchanged, but the 7 A.M. Sept. 3 was slightly adjusted to the S.W. to near 18.0 degrees N., 49.0 degrees W. The new 7 A.M. Sept. 4 position was near 20.0 degrees N., 54.3 degrees W. in order to fit better the position for that day given in item 3); the new position is about 150 miles to the S. of the one in Neumann et al. (1993). The new 7 A.M. Sept. 5 position was near 22.5 degrees N., 56.5 degrees W., which fits better the position for that day given in item 3) as well as the narrative in item 2); such a position is also about 150 miles to the S. of the one in Neumann et al. (1993). The 7 A.M. Sept. 6 position in the above publication was slightly adjusted to the S.W. to near 26.3 degrees N., 58.0 degrees W. to fit better the narrative in item 2). Slight adjustments to the S.W. and W. were made for the 7 A.M. positions for Sept. 7 and Sept. 8 in order to fit better space-time continuity along the track and to fit the Sept. 8 position in item 3), respectively. These adjustments resulted in a new position near 31.3 degrees N., 55.3 degrees W. for 7 A.M. Sept. 7 and in a new position near 34.0 degrees N., 49.0 degrees W. for 7 A.M. Sept. 8. Similarly, slight eastward adjustments were made for the 7 A.M. Sept. 9 and Sept. 10 positions in Neumann et al. (1993), resulting in positioms near 34.5 degrees N., 43.0 degrees W. and near 35.3 degrees N., 35.0 degrees W., which closely fit corresponding positions in item 3). The 7 A.M. Oct. 11 position in Neumann et al. (1993) was kept unchanged. The new track for Storm 5, 1889 is shown in Fig. 2.

The "disturbances of great violence" which accompanied the storm over the period Sept. 8-11 (item 1) were found to justify the hurricane status that Neumann et al. (1993) attributed to Storm 5, 1993.

Storm 6, 1889 (Sept. 12-26), H.

The following information was found in relation to this storm: 1) Storm of Sept. 12-26, 1889. Guadeloupe, west Gulf (Tannehill, 1938). 2) Observations from Jamaica (Holland Bay): Sept. 13. wind N., gusts of wind, sea somewhat risen. Sept. 13, 7 A.M., barometer 29.82 inches, calm, covered, cirrocumulus from N.E. (Monthly Weather Review, Sept. 1889). Author's note: These observations as well as observations from Cuba and other Caribbean islands were furnished to the Signal Service by Father Benito Vines, S.J. of the Belen College Observatory, Havana. 3) Observations from Santo Domingo: Sept. 13-14, not available because telegraph lines interrupted (Monthly Weather Review, Sept. 1889). 4) Observations from Santiago de Cuba: Sept. 13, 10 A.M., barometer 29.88 inches; 3 P.M., barometer 29.79 inches, wind N.N.E. 15 mph, cirrocumulus from E.N.E., cumulus, high from S.E., cirrus from S. Sept. 14, 7 A.M., barometer 29.82 inches, wind N.E. 7 mph, cloudy, cirrostratus from S.E., nimbus from N.E.; 2 P.M., barometer 29.80 inches, wind N.E., variable, 2 mph, light rain. Sept. 15, 3 A.M., barometer 29.72 inches,; 7 A.M., barometer 29.78 inches, wind S.E. 5 mph, wariable, mist, continued rain, some strong gusts of wind from the E.N.E. at dawn; 3 P.M., barometer 29.84 inches, wind S.E. 3 mph, variable, light rain, nimbus from S.E. and S.S.E. (Monthly Weather Review, Sept. 1889). 5) Observations from Cienfuegos: Sept. 14. 2 P.M., barometer 29.89 inches, variable breezes E.N.E. inclining to N., cumulus from N.E. Sept. 15, 2 P.M., barometer 29.72 inches, wind N.N.W., gusts of wind N.E. (Monthly Weather Review, Sept. 1889). 6) Observations from Quemado de Guines (central Cuba): Sept. 14, 10 A.M., barometer 29.88 inches, wind N.; 10 P.M., 29.80 inches, wind N., light breeze. Sept. 15., 4 A.M., barometer 29.76 inches, wind N., breeze, squalls from 1:30 A.M.; 8:30 A.M., barometer 29.80 inches, sky covered, light rain E. and S.; 3:25 P.M., barometer 29.69 inches, wind N.E., light rain, low cumulus from E.N.E. (Monthly Weather Review, Sept. 1889). 7) San Juan y Martinez (western Cuba): Sept. 16, 6 P.M., barometer 29.72 inches, cirrus from S., cumulus clouds to W. (Monthly Weather Review, Sept. 1889). 8) Havana: The position of the center of the disturbance was better determined as being to the S.S.E. of Santiago de Cuba and to the S.E. of Jamaica at 1 P.M. Sept. 14. On the morning of Sept. 15 the storm of Jamaica approached from the S.E.. While we in Havana were surrounded by a relative calm, sulty heat and very low barometer in the evening of Sept. 16, in Cienfuegos there was rising barometer and heavy squalls from the S. The nebulous edge of the latter portion of the depression was crossing by Havana during the evening of Sept. 17, and in the morning of Sept. 18 we found ourselves still in its outside portion. During the evening of Sept. 17 we had brisk winds of 22 mph with gusts to 35 mph, sky of a very stormy aspect and strong currents in the region of rain-clouds (Monthly Weather Review). 9) The steamer "Mascotte", on its journey from Tampa to Key West, was on the evening of Sept. 17 overtaken by hurricane winds from E. shifting to S.E. which finally acquired a velocity of 65 mph (Monthly Weather Review, Sept. 1889). Author's note: This marine report was also furnished to the Signal Service by Father Vines, director of the Belen College Observatory, Havana.

These high winds were probably associated with the outer rainbands of the storm. 10) Key West, Sept. 16. The weather here is rainy, stormy and threatening. At 6 P.M. Havana reports indicated that the cyclone center was S. of that city, moving westward ((The New York Times, Sept. 17, 1889, p.3, col.6). 11 Maximum winds at some Florida stations: Titusville, E. 47 mph; Jupiter, E. 46 mph; Key West, E. 60 mph (Monthly Weather Review, Sept. 1889). Author's note: The above winds were reported to have occurred on Sept. 16. 12) Sept. 15-18. 1889. Extensive cyclonic perturbation which, after passing S. of Jamaica, affected most of Cuba, from Nuevitas to Cape San Antonio. It was accompanied by torrential rains and very strong gusty winds were felt in many places. There was considerable damage. It caused great damage in Yucatan (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza, which is included in Sarasola (1928). 13) The cyclonic perturbation of Sept. 15 to 20 (1889) did considerable damage to the roof of the Buen Viaje church at Remedios (Martinez-Fortun, 1942). Author's note: Remedios is a town which is located near the northern coast of central Cuba. 14) The cyclone at Carmen, off the coast of Campeche, started about 2 P.M. Sept. 18 and was heralded by a rapidly falling barometer. It did not, however, gained its full strength until night. The wind then shifted from the W. to due S. with an impetuosity that caused the vessels in the Carmen harbor to drag their anchors. Masts were snapped and sails torn in shreds. The following morning the shores were strewn with wreckage, there being only one vessel that weathered the great gale out of 35 vessels of all kinds in the port. The hurricane uprooted great trees, which fell upon houses in Carmen, destroying in all over 100 and damaging 250 others (Monthly Weather Review, Sept. 1889). Author's note: The narrative above was extracted from a detailed report of the storm dated at Mexico City on Oct. 4, 1889 and telegraphed to The New York Herald. 15) At 8 P.M. Sept. 22 the storm was apparently central near the mouth of the Mississippi to the S.E. of Port Eads, but its presence could not be definitely determined at that report. Twelve hours later the center had advanced to the vicinity of Mobile, Al.; southeasterly gales were reported at Pensacola, Fl. while the wind was light and from the N. at Mobile. The course continued northeasterly, passing over Alabama, northern Georgia and central North Carolina during the succeding 24 hours, attended by from 2 to 3 inches of rain at stations near the center of the disturbance. The pressure increased slowly at the center during the N.E. movement with loss of energy, and when the disturbance reached the middle Atlantic coast the barometer (reading) at the center was 29.88 inches and the greatest maximum velocity of wind was 36 mph. It probably joined with a low pressure area in the lower Saint Lawrence Valley (Monthly Weather Review, Sept. 1889). 16) Storm of Sept. 22-23, 1889. Coastal areas of Louisiana, Mississippi and Alabama. Minor. On Sept. 23-24 affected all sections of Georgia and the Carolina coast, also as a minor storm (Dunn and Miller, 1960). 17) Maximum winds at some Florida and Georgia stations: Pensacola, S.E. 40 mph; Cedar Keys, E. 42 mph; Jacksonville, S. 32 mph; Atlanta, E. 30 mph (Monthly Weather Review, Sept. 1889). Author's note: The above winds were reported to have occurred on Sept. 23. 18) Jacksonville, Fl., Sept.

24. Reports indicate that yesterday's storm was a disastrous one to property but no further loss of life was reported. A Times Union reporter took a drive this morning through the outlying country for many miles and reported fallen trees everywhere. At Switzerland, Panama Park, Scotland, Mayport, New Berlin, etc. houses and trees were blown dowm (The New York Times, Sept. 25, 1889, p.4, col.5). 19) From numerous vessel reports, materials furnished by Father Vines and information collected about the storm in the United States, the approximate course of the storm was chartered. Daily positions on the map were as follows: Sept. 13, 14 degrees N., 69.5 degrees W.; Sept. 14, 14 degrees N., 73 degrees W.; Sept. 15, 15 degrees N., 77.5 degrees W.; Sept. 16, 16 degrees N., 82. 5 degrees W.; Sept. 17, 17.3 degrees N., 86.5 degrees W.; Sept. 18, 20 degrees N., 90 degrees W.; Sept. 19-21, positions were not given along a probable track; Sept. 22, 28.5 degrees N., 90 degrees W., Sept. 23, 30.7 degrees N., 87.3 degrees W.; Sept. 24, 36.3 degrees N., 80.5 degrees W.; Sept. 25, 37.5 degrees N., 73 degrees W. (Monthly Weather Review, Sept. 1889). Author's note: This track was not found to differ much from the one in Neumann et al. (1993), except that it ran somewhat to the S. of the above mentioned track along the Caribbean Sea and somewhat to the N. of it over the Yucatan peninsula and the eastern portion of the Bay of Campeche. 20) The storm lasted for 14 days. It was first observed at lat. 16 N., long. 61 W. on Sept. 12, it recurved at lat. 24 N., long. 94 W. and it was last observed at lat. 49 N., long. 63 W. Approximate daily positions (as inferred from the map showing the storm track) were as follows: Sept. 12, lat. 16 N., long. 61 W.; Sept. 13, lat. 16.5 N., long. 65 W.; Sept. 14, lat. 17.5 N., long. 70.5 W.; Sept. 15, lat. 18.5 N., long. 76 W.; Sept. 16, lat. 20.5 N., long. 81 W.; Sept. 17, lat. 22.5, long. 85 W.; Sept. 18, lat. 23 N., long. 87.5 W.; Sept. 19, lat. 22.5 N., long. 89.5 W.; Sept. 20, lat. 22.5 N., long. 92.5 W.; Sept. 21, lat. 24 N., long. 94 W.; Sept. 22, lat. 27 N., long. 93 W.; Sept. 23, lat. 30.5 N., long 87.5 W.; Sept. 24, lat. 36 N., long. 80.5 W.; Sept. 25, lat. 38.5 N., long. 74 W.; Sept. 26, lat. 49 N., long. 63 W. (Mitchell, 1924). Author's note: This track was found to be significantly to the N. of the one in item 19) over the Caribbean Sea, and brought the storm over western Cuba and just N. of the Yucatan peninsula. Therefore, this second track was found to greatly differ from the one in Neumann et al. (1993).

Information contained in some of the items above suggested that there was room for improving the storm track in Neumann et al. (1993). This, of course, required new estimates of 7 A.M. positions on several days and it should be mentioned that the confidence the author of this study had in those positions is rather low because such positions were not inferred, in many cases, from data in the vicinity of the track. In fact, they were inferred from available information at locations which in many cases were away from the estimated storm path and, in addition, could have been responding to more than one disturbance within a very extended area of barometric depression, as mentioned in the Monthly Weather Review, Sept. 1889.

Based on the facts that the starting date of the storm indicated in items 1) and 20) was Sept. 12, 1889 and that the

island of Guadeloupe and a point in lat. 16 N., long. 61 W. were respectively mentioned in those items, the author of this study decided to start his track by using an estimated position near 15.7 degrees N., 61.7 degrees W. for 7 A.M. Sept. 12, instead of accepting a nearby position near 15.5 degrees N., 60.5 degrees W. which is showm in Neumann et al. (1993) as for 7 A.M. Sept. 11 or 24 hours earlier. The author's estimated 7 A,M. position for Sept. 13 was near 15.7 degrees N., 67.5 degrees W. and was essentially based on interpolation between his 7 A.M. Sept. 12 estimated position and his 7 A.M. Sept. 14 estimated position which was near 16.0 degrees N., 73.3 degrees W. and was based on the location to the S.S.E. of Santiago de Cuba and to the S.E. of Jamaica given for 1 P.M. Sept. 14 (item 8). Information that the storm passed S. of Jamaica (item 12) and reports that the lowest pressure occurred at Santiago de Cuba at an early hour of Sept. 15 and that, at that place, the direction the nimbus clouds were coming from changed from N.E. on Sept. 14 to S.E. and S.S.E. on Sept. 15 (item 4), both indicating that the trough extending northward or northnortheastward from the storm center had passed to the west of that city, were helpful to the author of this study in estimating his 7 A.M. Sept. 15 position near 16.7 degrees N., 77.7 degrees W. The author's 7 A.M. Sept. 16 estimated position was near 18.0 degrees N., 81.5 degrees W. and was primarily based on weather conditions at Havana and Cienfuegos in the evening of Sept. 16 (item 8), a statement that the storm center was towards the S. of Havana at 6 P.M. Sept. 16 (item 10) and some space-time continuity applied backwards. The author's 7 A.M. Sept. 17 estimated position was near 19.3 degrees N., 85.5 degrees W. and was chiefly based on space-time continuity, although weather information from Havana on Sept. 17 (item 8) was also taken into account. The author's 7 A.M. Sept. 18 estimated position was near 19.5 degrees N., 89.5 degrees W. and was based on space-time continuity to allow for westerly winds to have occurred at Carmen in the afternoon of Sept. 18 (item 14). The 7 A.M. Sept. 19 position displayed in Neumann et al. (1993) was accepted by the author of this study because it was found to satisfy the wind shift from the W. to due S., with the hurricane to its full strength, which occurred at Carmen on the night of Sept. 18 (item 14). Daily 7 A.M. positions in Neumann et al. (1993) for the period Sept. 20-26 were also accepted because they were found to be supported, in general, by most information contained in items 15) through 20). The track for Storm 6, 1889 which was prepared by the author of this study is shown in Fig. 2.

After having carefully examined the content of the above items, the author of this study believes that the storm was of weak to moderate intensity while traveling westward over most of the Caribbean Sea and that, probably, it did not reach the hurricane status which was assigned to it in Neumann et al.(1993) until Sept. 17, to the S. of the western tip of Cuba and to the east of the Yucatan peninsula. In the author's opinion, the intensification on that day was reflected to a good extent in the wind increase and weather deterioration at Havana (item 8) and, probably, in the very strong winds encountered by the "Mascotte" on Sept. 17 (item 9). Indications are that the storm preserved hurricane intensity while traveling westward over the Yucatan peninsula, justifying the

tremendous fury of the gales reported to have occurred at Carmen during the latter part of the day and the night of Sept. 18 (item 14) as well as the great damage reported to have occurred in Yucatan (item 12). The storm apparently weakened over the Gulf of Mexico before passing near the mouth of the Mississippi River during the evening and night of Sept. 22 and making landfall near Mobile in the morning of Sept. 23 (item 15), resulting in the occurrence of maximum winds of only 40 mph at Pensacola and 42 mph at Cedar Keys (item 17).

Storm 7, 1889 (Sept. 12- 19), T. S.

Very litte information was found about this storm: 1) Storm of Sept. 12-19, 1889. Far out in the Atlantic (Tannehill, 1938). 2) The storm lasted for 7 days. It was first observed at lat. 15 N., long. 27 W. on Sept. 12, it recurved at lat. 39 N., long. 50 W. and it was last observed at lat. 43 N., long. 49 W. A track for this storm is shown on a map (Mitchell, 1924). Author's note: The above mentioned track was found to be quite similar to the one in Neumann et al. (1993).

As the information contained in the items above was found to be inadequate to check the storm track in Neumann et al. (1993) in the light of some marine data, the author of this study decided to accept such a track and to reproduce it in Fig. 2.

Similarly, the tropical storm status which Neumann et al. (1993) attributed to this storm was accepted since it could not be checked in the light of the very limited information found about the storm.

Storm 8, 1889 (Sept. 29- Oct.6), T. S.

Quite limited information was found about this storm: 1) Storm of Sept. 29- Oct. 6, 1889. East of Tobago, recurved near Bermuda (Tannehill, 1938). 2) It was central over or near the Windward Islands on Oct. 1 and 2, whence it moved N.W. to about 28 degrees N., 68 degrees W. by Oct. 4, where it recurved and passed W. and N. of Bermuda to the 35 degrees N. parallel by Oct. 5, and on the morning of Oct. 6 was central off the southern edge of the Banks of Newfoundland, after which it apparently dissipated. This system exhibited great energy on Oct. 5, when strong to whole gales were encountered N. and N.E. of Bermuda (Monthly Weather Review, Oct. 1889). 3) The steamer "Saltram", from Gibraltar, Sept. 21, was struck by a terrific hurricane from the N. on Oct. 4 in lat. 35 50 N., long. 62 50 W. From 10 A.M. to 1 P.M. the ship was swept by tremendous seas. The wind backed around to the W. and then to S.S.E. with great fury. On Oct. 6 the wind abated, but on Oct. 7 heavy rains fell and the wind blew a very stiff gale. Towards evening, the wind shifted to N.W. and cleared (The New York Times, Oct. 10, 1889, p.9, col.3). Author's note: The date of Oct. 4 seems to be in error and the "Saltram" should have met the storm on Oct. 5. The wind change from W. to S.S.E. with great fury looks suspicious to have occurred in this case of a westward bound steamer meeting a storm traveling to the N.E. The facts that the wind abated on Oct. 6 and that a stiff gale with a wind shift to

N.W. was reported on Oct. 7 are believed to be unrelated to this storm and suggest that they reflected the influence of another low pressure system, probably Storm 9, 1889. 4) Map showing a track for the storm. Daily positions are: Oct. 1, 15.5 degrees N.,61 degrees W.; Oct. 2, 17.5 degrees N., 63 degrees W.; Oct. 3, 21.5 degrees N.; 66 degrees W.; Oct. 4, 27.7 degrees N., 68 degrees W.; Oct. 5, 34.8 degrees N., 63 degrees W.; Oct. 6, 42 degrees N., 54 degrees W. (Monthly Weather Review, Oct. 1889). 5) The storm lasted for 7 days. It was first observed at lat. 11 N., long. 52 W. on Sept. 29, it recurved at lat. 28 N., long. 67 W. and it was last observed at lat. 41 N., long. 57 W. (Mitchell, 1889).

In general, the storm track shown in Neumann et al. (1993) was found to be reasonable in the light of the information contained in the above items. Therefore, such a track was accepted without any modification and reproduced in Fig. 2.

Although the information furnished by the "Saltram" (item 3) suggested hurricane intensity, the author of this study was unable to confirm such status from other sources and, therefore, decided to keep unchanged the tropical storm classification that Neumann et al. (1993) assigned to this storm.

Storm 9, 1889 (Oct. 5-10), T. S.

The following information was found in relation to this storm: 1) Storm of Oct. 5-11, 1889. Isle of Pines, northeastward to Atlantic (Tannehill, 1938). 2) Storm of Oct. 5, 1889. Southeast Florida coast. Minor (Dunn and Miller, 1960). 3) The presence of a barometric depression near western Cuba was indicated by the reports of Oct. 4 and 5 and by Oct. 6 the center of disturbance had apparently advanced northeastward to N. of the Bahamas, whence it moved rapidly N.E. to the 40 degrees N. parallel by Oct. 7, and thence passed northward to the Saint Lawrence Valley by Oct. 8. This depression augmented in energy until Oct. 7, when pressure below 29.60 inches and fresh to strong gales were reported off the middle Atlantic and New England coasts. The northern course of the storm after the morning of Oct. 7 was apparently due to high barometric pressure to the E. and N.E., the barometer over Newfoundland ranging to 30.47 inches at St. John's, giving a gradient of about 0.90 inches in about 900 miles on the morning of that day (Monthly Weather Review, Oct. 1889). Author's note: The storm in the vicinity of and over western Cuba should have been very weak, to the point that it is not included in the catalog of Cuban cyclones, such as Sarasola (1928) and Martinez-Fortun (1942). 4) Steamer "Saltram", from Gibraltar Sept. 21. On Oct. 7 met with heavy rain and the wind blew a stiff gale. Towards the evening the wind shifted to N.W. and cleared up (The New York Times, Oct. 10, 1889, p.9, col.3). Author's note: Although no position was given, it is very likely that this report was related to the storm. 5) Map showing a track for this storm. Daily positions are: Oct. 6, 28.7 degrees N., 79 degrees W.; Oct. 7, 39.8 degrees N., 68 degrees W. (Monthly Weather Review, Oct. 1889). 6) The storm lasted for 6 days. It was first observed at lat. 21 N., long. 82 W. on Oct. 5 and last observed at lat. 64 N., long. 55 W. (Mitchell, 1924).

Because information contained in items 1), 3) and 6)

suggested a 7 A.M. Oct. 5 position just S. of or over Cuba and not over southern Florida as shown in Neumann et. al. (1993), the author of this study decided to improve the track for this storm by starting it at 7 A.M. Sept.5 near 21.5 degrees N., 82.0 degrees W., the same location Neumann et. al. (1993) had used as they started their track 24 hours earlier (7 A.M. Oct. 4). By so doing, a very doubtful 7 A.M. Oct. 4 position was eliminated from the track. Next, the 7 A.M. Oct.6 position in Neumann et al. (1993) was adjusted southsouthwestwards by about 175 miles to near 29.0 degrees N., 79.5 degrees W. in order to better fit the corresponding information for Oct. 6 in item 5) and, at the same time, to still satisfy information regarding that the storm affected southeast Florida on Oct. 5 (item 2). The track in Neumann et al. (1993) for the period Oct. 7-10 was kept unchanged, except that it was extended to the northern boundary of the map to satisfy information in item 6). The new track for Storm 9, 1889 is displayed in Fig. 2.

Pressure and wind information contained in item 3) was found to justify the tropical storm status that Neumann et al. (1993) attributed to this storm.

Special statement.

In addition to the storms which were previously discussed, the author of this study took note of two other possible cases about which the information which was available to him was insufficient to fully verify their existence and/or to determine a reliable evolution for them. These cases were as follows:

A) Case of Jun. 24-25, 1889.

The following information allowed one to identify this possible case: 1) A low pressure area appeared off the Carolina coast on Jun. 24. By the next day, observations showed that it had moved to the N.W. accompanied by fresh to moderate gales on the Carolinas (Monthly Weather Review, Jun. 1889). 2) Map showing the low pressure area near 31 degrees N., 77 degrees W. on Jun. 24. The S.E.-N.W. oriented track extended to about mid-distance between Charleston, S.C. and Wilmington, N.C. (Monthly Weather Review, Jun. 1889). 3) Maximum winds for Jun. 1889 were: Augusta, N. 26 mph on Jun. 25; Charleston, E. 35 mph on Jun. 17; Wilmington, S. 27 mph on Jun. 4 (Monthly Weather Review, Jun. 1889). Author's note: The only maximum wind coresponding to this possible case was the one for Augusta, showing a maximum of 26 mph. on Jun. 25.

The wind reported at Augusta was certainly below tropical storm intensity and it is obvious that no wind of tropical storm intensity was reported at Charleston and Wilmington during the entire month. Therefore, the author decided to keep this as a possible case, in spite of the fresh to moderate gales mentioned in item 1).

B) Case of Oct.14-16, 1889.

The following information pertains to this possible case: 1) A depression, which had originated over land, was central near 39 degrees N., 72 degrees W. on Oct. 14. By Oct. 15 it had moved southward to the 36 degrees N. parallel and apparently merged with a westward moving depression which was to the east of Bermuda on

Oct. 14. Marked decrease in central pressure was shown and gales of hurricane force were reported off the middle Atlantic coast. During the next 24 hours (Oct. 15 to 16), the center of disturbance moved southward to the 34 degrees N. parallel, with pressure below 29.50 inches and gales of hurricane force, after which it moved rapidly E.N.E. (Monthly Weather Review, Oct. 1889). 2) Violent gales prevailed at Nantucket, Chatham and Vineyard Haven, Ma., on Oct. 14 (The New York Times, Oct. 15. 1889, p.2, col.5). 3) The storm of yesterday extended over a large extent and was moving slowly N.E., the center being out at sea off Block Island; however, it extended from Charleston, S.C. to Eastport, Me. The wind at Block Island increased from 55 mph at 8 A.M. to 72 mph at 11 P.M. Oct. 14 (The New York Times, Oct. 15, 1889, p.2, col.7). 4) The "Ems" met a series of heavy winds and storms veering from W.S.W. to N.W. and N. from Oct. 10 to 15, after which the steamer was struck by a hurricane from E.N.E. accompanied by a heavy cross sea (The New York Times, Oct. 17, 1889, p.9, col.4). Author's note: The days given look suspicious because the steamer should have arrived in New York on Oct. 16, the day before The New York Times published the statement. The vessel most likely met the "hurricane" on Oct. 15, but not after Oct. 15 as implied by the statement. 5) The steamer "Ocean" left Bremen on Sept. 26 and on Oct. 15 a hurricane blew from the E.N.E. with great violence, causing heavy cross seas (The New York Times, Oct. 17, 1889, p.9, col.4).

This intense storm could have acquired tropical characteristics while moving over the Gulf Stream. However, as such occurrence could not be definitively supported or denied in the light of the above information, the author of this study decided to keep this severe tempest as a possible case.